

WHAT IS CLAIMED IS:

1 1. A method of measuring a thickness of a tissue, the method
2 comprising:
3 reflecting three wavelengths of light from the tissue by directing a
4 measurement light beam along an optical path toward the tissue;
5 measuring an interference signal for each of the three wavelengths of the
6 reflected light; and
7 determining a separation distance between positions of at least two reflecting
8 tissue surfaces along the optical path by combining the measured signals.

1 2. The method of claim 1 wherein the measurement light beam
2 comprises three wavelengths simultaneously directed along the path toward the tissue and
3 wherein three interference signals are measured simultaneously.

1 3. The method of claim 1 further comprising determining a frequency
2 component of a Fourier series from the interference signal of each of the three wavelengths.

1 4. The method of claim 3 further comprising:
2 transforming the measured the frequency components of the Fourier series to
3 spatial components, the spatial components describing positions and intensities of the light
4 beam reflected from the tissue along the optical path.

1 5. The method of claim 1 further comprising determining a tomography
2 of the tissue by directing the measurement beam to several locations of the tissue, the
3 locations having at least two reflecting tissue surfaces along the optical path.

1 6. The method of claim 5 further comprising:
2 scanning the light beam from a first location to a second location, wherein the
3 first location and the second location are among the locations used to determine the
4 tomography of the tissue.

1 7. A method of treating a tissue, the method comprising:
2 directing an ablative light beam to the tissue to form a desired shape in the
3 tissue;

4 reflecting three wavelengths of light from the tissue by directing a
5 measurement light beam along an optical path toward the tissue;
6 measuring an interference signal for each of the three wavelengths of the
7 reflected light; and
8 determining positions of at least two reflecting tissue surfaces along the
9 optical path by combining the measured signals while the ablative light beam is directed
10 toward the tissue;

1 8. The method of claim 7 wherein the measurement light beam
2 comprises three wavelengths simultaneously directed along the path toward the tissue and
3 wherein three interference signals are measured simultaneously.

1 9. The method of claim 7 further comprising determining a frequency
2 component of a Fourier series from the interference signal of each of the three wavelengths.

1 10. The method of claim 9 further comprising:
2 transforming the measured the frequency components of the Fourier series to
3 spatial components, the spatial components describing positions and intensities of the light
4 beam reflected from the tissue along the optical path.

1 11. A method of treating a tissue, the method comprising:
2 directing an ablative beam for ablating the tissue via a scanning device to the
3 tissue;
4 directing a measurement beam for measuring a profile of the tissue via the
5 scanning device to the tissue, wherein a path of the ablative beam and a path of the
6 measurement beam are substantially concentric as directed onto the tissue.

1 12. The method of claim 11 wherein the path of the ablative beam and the
2 path of the measurement beam are substantially coaxial as directed onto the tissue.

1 13. The method of claim 11 further comprising measuring of the tissue
2 intermittently at time intervals between instances of ablation.

1 14. The method of claim 11 wherein the measurement beam is directed to
2 the tissue via the scanning device for measuring a thickness of the tissue.

1 15. A system for measuring a thickness of a tissue, the system
2 comprising:
3 a light source emitting a measurement light beam, the measurement light
4 beam directed along an optical path toward the tissue, three wavelengths of the light beam
5 reflecting from the tissue;
6 an interferometer generating an interference signal for each of the three
7 wavelengths of the measurement light beam reflected from the tissue; and
8 a processor determining a separation distance between positions of at least
9 two reflecting tissue surfaces along the optical path by combining the interference signals.

1 16. The system of claim 15 wherein the measurement light beam
2 comprises three wavelengths simultaneously directed along the path toward the tissue and
3 wherein three interference signals are measured simultaneously.

1 17. The system of claim 15 wherein the interference signal of each of the
2 three wavelengths is used to determine a frequency component of a Fourier series.

1 18. The system of claim 17 wherein the processor transforms the
2 frequency components of the Fourier series to spatial components, the spatial components
3 describing positions and intensities of the light beam reflected from the tissue along the
4 optical path.

1 19. The system of claim 18 further comprising an optical system directing
2 the measurement beam to several locations of the tissue so as to determine a tomography of
3 the tissue, the locations having at least two reflecting tissue surfaces along the optical path.

1 20. The system of claim 19 further comprising:
2 wherein the optical system scans the light beam from a first location to a
3 second location, and wherein the first location and the second location are among the
4 locations used to determine the tomography of the tissue.

1 21. A system for treating a tissue, the system comprising:
2 an ablative light source emitting an ablative light beam;

3 a light source emitting a measurement light beam, the measurement light
4 beam directed along an optical path toward the tissue, three wavelengths of the light beam
5 reflecting from the tissue;
6 an interferometer generating an interference signal for each of the three
7 wavelengths of the measurement light beam reflected from the tissue; and
8 a processor controlling the ablative light beam and determining positions of at
9 least two reflecting tissue surfaces along the optical path by combining the interference
10 signals.

1 22. The system of claim 21 wherein the measurement light beam
2 comprises three wavelengths simultaneously directed along the path toward the tissue and
3 wherein three interference signals are measured simultaneously.

1 23. The system of claim 21 wherein the interference signal of each of the
2 three wavelengths is used to determine a frequency component of a Fourier series and
3 wherein the processor transforms the frequency components of the Fourier series to spatial
4 components, the spatial components describing positions and intensities of the light beam
5 reflected from the tissue along the optical path.

1 24. An apparatus for ablating tissue, the apparatus comprising:
2 an ablative light source producing an ablative light beam;
3 a measurement light source producing a measurement light beam; and
4 a scanner receiving the ablative beam from the ablative light source and the
5 measurement beam from the measurement light source, the scanner including optical
6 elements for directing the ablative beam and the measurement beam to locations across the
7 tissue so as to ablate the tissue with the ablative beam and measure a profile of the tissue
8 with the measurement beam, a path of the ablative beam and a path of the measurement
9 beam being substantially concentric at the tissue.

1 25. The apparatus of claim 24 wherein the path of the ablative beam and
2 the path of the measurement beam are substantially coaxial as directed onto the tissue.

1 26. The apparatus of claim 24 further comprising a processor electrically
2 connected with the ablative light source and the measurement light source, the processor
3 controlling of the ablative light beam and the measurement light beam.

1 27. An apparatus for treating tissue comprising:
2 an ablative light source producing an ablative beam;
3 a beam delivery device directing the ablative beam onto a tissue;
4 a microscope having a viewing port; and
5 an optical pachymeter emitting a measurement light beam directed along an
6 optical path toward the tissue, three wavelengths of the light beam reflecting from the tissue,
7 the optical pachymeter comprising an interferometer generating an interference signal for
8 each of the three wavelengths of the measurement light beam reflected from the tissue, the
9 pachymeter including a processor determining a separation distance between positions of at
10 least two reflecting tissue surfaces along the optical path by combining the interference
11 signals.

1 28. The ablation apparatus of claim 27 wherein the measurement light
2 beam comprises three wavelengths simultaneously directed along the path toward the tissue
3 and wherein three interference signals are measured simultaneously.

1 29. The ablation apparatus of claim 27 wherein the interference signal of
2 each of the three wavelengths is used to determine a frequency component of a Fourier
3 series and wherein the processor transforms the frequency components of the Fourier series
4 to spatial components, the spatial components describing positions and intensities of the
5 light beam reflected from the tissue along the optical path.

1 30. A method of measuring a separation distance between positions of
2 at least two reflections along an optical path, the method comprising:
3 reflecting at least three wavelengths of light at the positions by directing a
4 measurement light beam along the optical path;
5 measuring an interference signal for each of the at least three wavelengths
6 of the reflected light; and
7 determining the separation distance between the positions of the at least
8 two reflections along the optical path by combining the interference signals.